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CHI MEI OPTOELECTRONICS CORP.

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Model No.: N154I2-L05 (NF4I205902)
Preliminary

TFT LCD Preliminary Specification

MODEL NO.: N154I2-L05

Customer : Acer

Approved by :

Note :

記錄	工作	審核	角色	投票
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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 0.0	Sep.27, 2006	All	All	Tentative specification first issued.
Ver 1.0	Dec.15, 2006			Preliminary specification release.
Ver 1.1	Jan.02, 2007	20	7.2	Average Luminance of White spec.

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

N154I2-L05 is a 15.4" TFT Liquid Crystal Display module with single CCFL Backlight unit and 30 pins LVDS interface. This module supports 1280 x 800 Wide-XGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is not built in.

1.2 FEATURES

- Thin and light weight
- WXGA (1280 x 800 pixels) resolution
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	331.2 (H) x 207.0 (V) (15.4" diagonal)	mm	(1)
Bezel Opening Area	335.0 (H) x 210.7 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1280 x R.G.B. x 800	pixel	-
Pixel Pitch	0.2588 (H) x 0.2588 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmission Mode	Normally white	-	-
Surface Treatment	Hard coating (3H), Glare	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	343.5	344.0	344.5	mm	(1)
	Vertical(V)	221.5	222.0	222.5	mm	
	Depth(D)	-	6.2	6.5	mm	
Weight		-	540	560	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

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2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

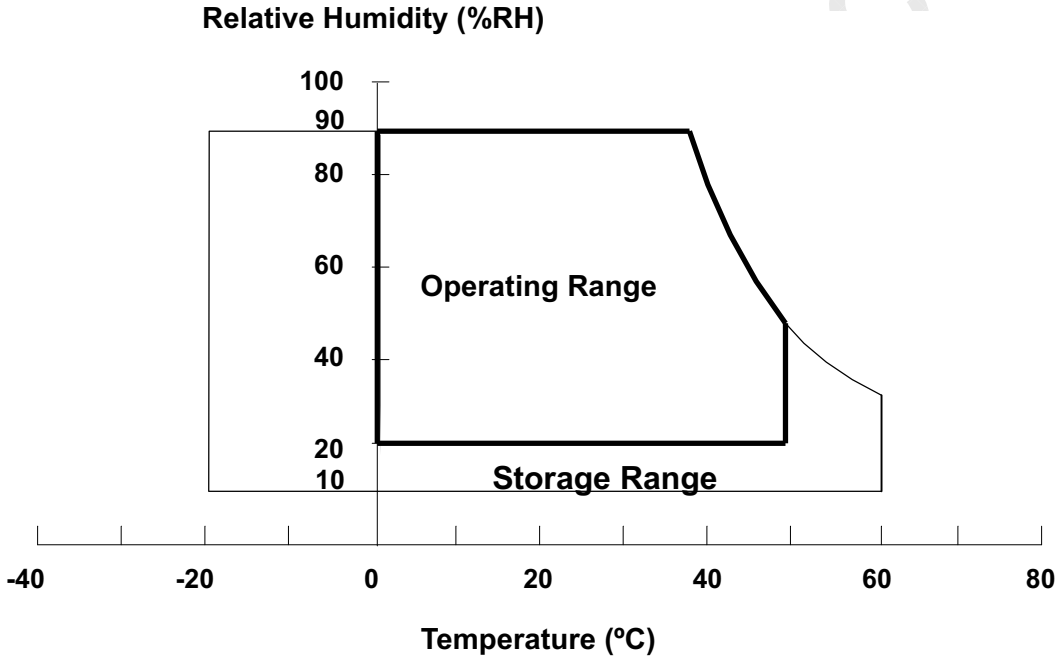
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	220G/2ms	G/ms	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1) (a) 90 %RH Max. (Ta <= 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel surface should be 0 ºC min. and 60 ºC max.

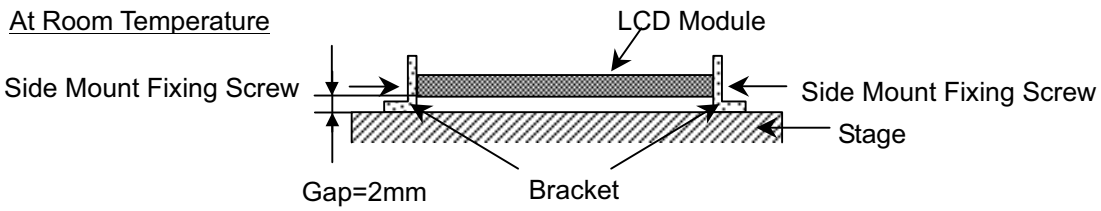


Note (3) 1 time for ± X, ± Y, ± Z. for Condition (220G / 2ms) is half Sine Wave,.

Note (4) 10~500 Hz, 0.5hr/cycle 1cycle for X,Y,Z

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:



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2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	Vcc+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	-	2.5K	V_{RMS}	(1), (2), I_L = 6.0 mA
Lamp Current	I_L	-	6.5	mA_{RMS}	(1), (2)
Lamp Frequency	F_L	-	80	KHz	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to Section 3.2 for further information).

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

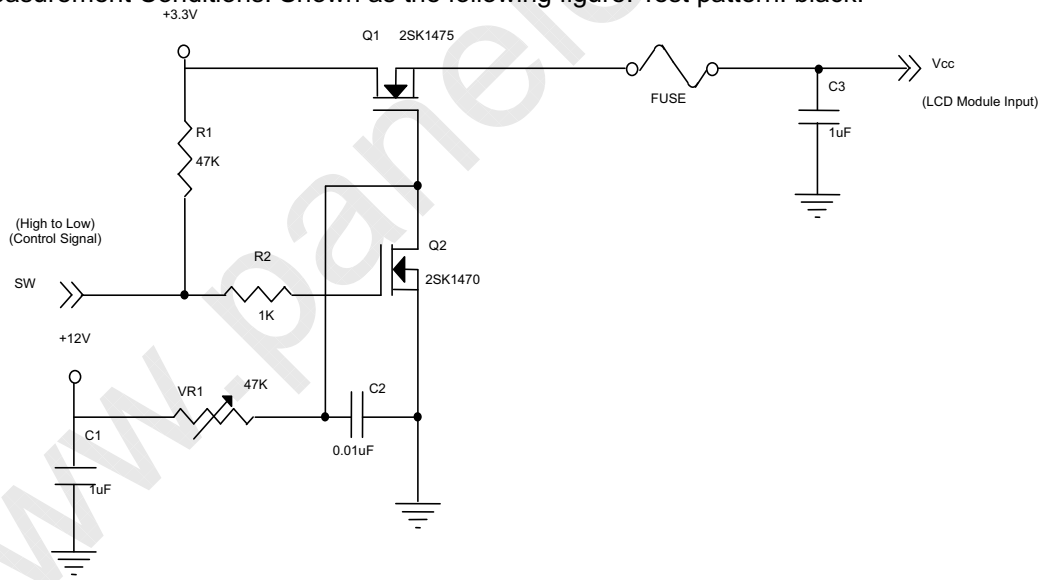
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	-	100	mV	-
Rush Current		I_{RUSH}			1.5	A	(2)
Initial Stage Current		I_{IS}	-	-	1.0	A	(2)
Power Supply Current	White	Icc	-	(280)	(350)	mA	(3)a
	Black		-	(360)	(450)	mA	(3)b
LVDS Differential Input High Threshold		$V_{TH(LVDS)}$	-	-	+100	mV	(5), V_{CM}=1.2V
LVDS Differential Input Low Threshold		$V_{TL(LVDS)}$	-100	-	-	mV	(5) V_{CM}=1.2V
LVDS Common Mode Voltage		V_{CM}	1.125	-	1.375	V	(5)
LVDS Differential Input Voltage		$\|V_{ID}\|$	100	-	600	mV	(5)
Terminating Resistor		R_T	-	100	-	Ohm	-
Power per EBL WG		P_{EBL}	-	(3.4)	-	W	(4)

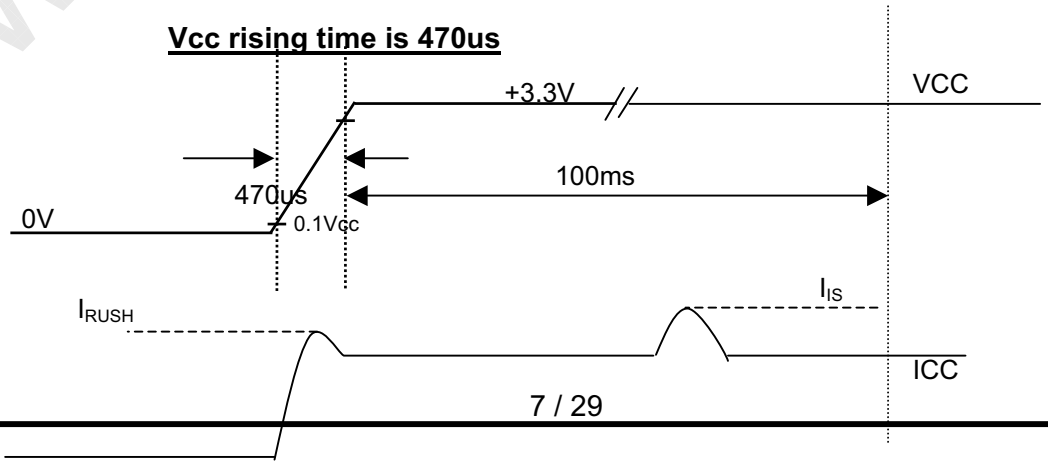
Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) I_{RUSH}: the maximum current when VCC is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.





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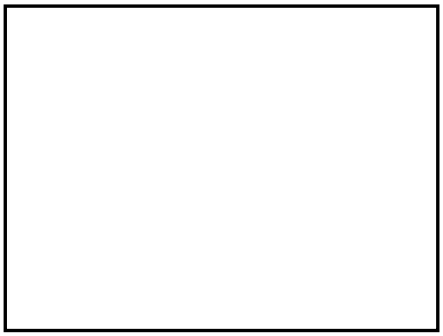
Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, DC Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern

Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

(a) Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz,

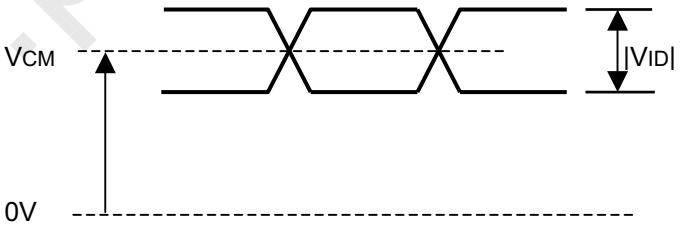
(b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.

(c) Luminance: 60 nits.

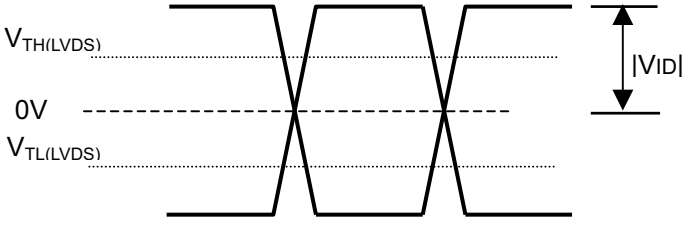
(d) The inverter used is provided from Sumida.

Note (5) The parameters of LVDS signals are defined as the following figures.

Single Ended



Differential



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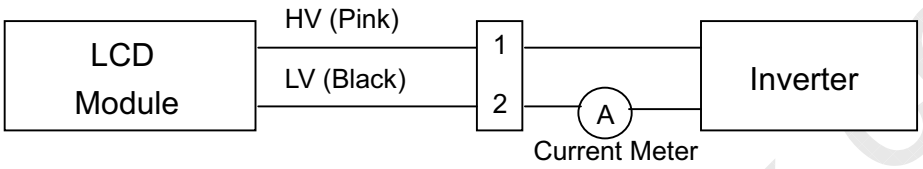
3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L				V_{RMS}	I_L = 6.0 mA
Lamp Current	I_L	2.0	(6.0)	(7.0)	mA_{RMS}	(1),(2)
		3.0				(1),(3)
Lamp Turn On Voltage	V_S	-	-		V_{RMS}	(4)
		-	-		V_{RMS}	(4)
Operating Frequency	F_L	40	-	80	KHz	(5)
Lamp Life Time	L_{BL}	12,000	-	-	Hrs	(7)
Power Consumption	P_L	-		-	W	(6), I_L = 6.0 mA

Note (1) Lamp current is measured by utilizing a high frequency current meter as shown below:



Note (2) for burst mode inverter design

Note (3) for continuous mode inverter design

Note (4) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (5) The lamp frequency may generate interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (6) $P_L = I_L \times V_L$

Note (7) The lifetime of lamp is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and I_L = 6.0 mA_{RMS} until one of the following events occurs:

(a) When the brightness becomes ≦ 50% of its original value.

(b) When the effective ignition length becomes ≦ 80% of its original value. (Effective ignition length is defined as an area that the brightness is less than 70% compared to the center point.)

Note (8) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid generating too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

The output of the inverter must have symmetrical (negative and positive) voltage waveform and

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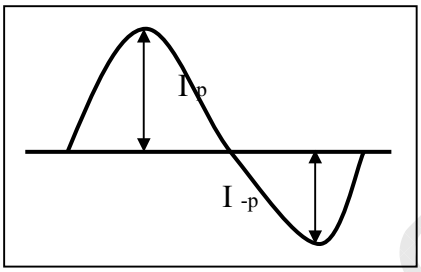
symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter, which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.

Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp. It shall help increase the lamp lifetime and reduce its leakage current.

a. The asymmetry rate of the inverter waveform should be 10% below;
b. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$;
c. The ideal sine wave form shall be symmetric in positive and negative polarities.



* Asymmetry rate:

$$| I_p - I_{-p} | / I_{rms} * 100\%$$

* Distortion rate

$$I_p \text{ (or } I_{-p}) / I_{rms}$$

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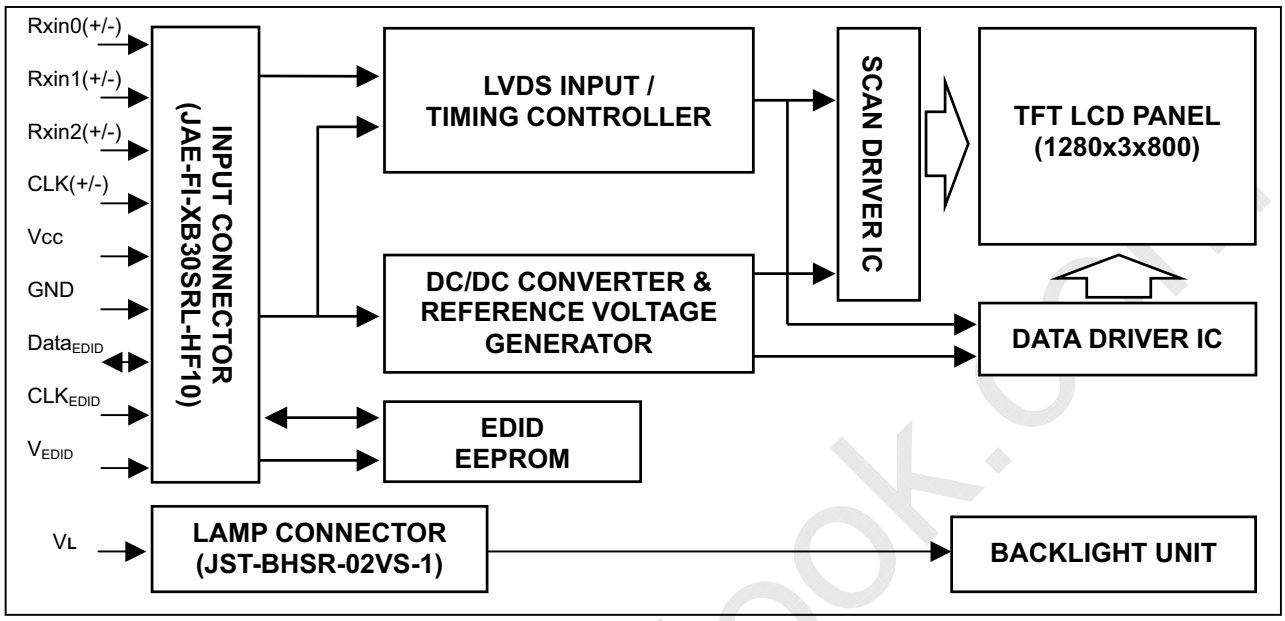
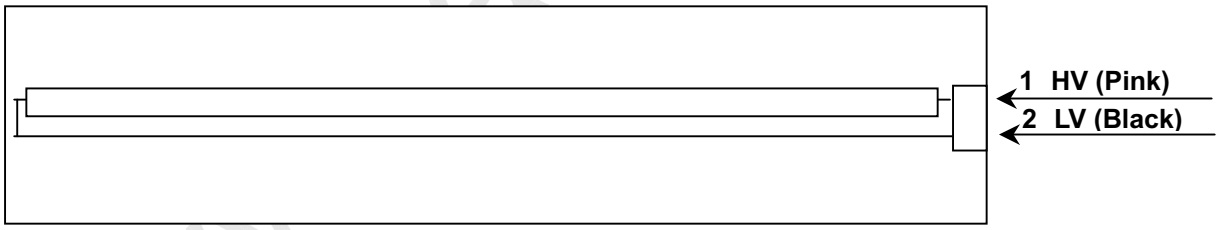
4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT



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5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	Vss	Ground		-
2	Vcc	Power Supply +3.3 V		-
3	Vcc	Power Supply +3.3 V		-
4	V_{EDID}	DDC +3.3 V		-
5	NC	-	-	-
6	CLK_{EDID}	DDC Clock		-
7	$Data_{EDID}$	DDC Data		-
8	Rxin0-	LVDS Differential Data Input	Negative	-
9	Rxin0+	LVDS Differential Data Input	Positive	
10	Vss	Ground		-
11	Rxin1-	LVDS Differential Data Input	Negative	-
12	Rxin1+	LVDS Differential Data Input	Positive	
13	Vss	Ground		-
14	Rxin2-	LVDS Differential Data Input	Negative	-
15	Rxin2+	LVDS Differential Data Input	Positive	
16	Vss	Ground		-
17	CLK-	LVDS Clock Data Input	Negative	-
18	CLK+	LVDS Clock Data Input	Positive	
19	Vss	Ground		-
20	NC	-	-	-
21	NC	-	-	-
22	NC		-	-
23	NC	-	-	-
24	NC	-	-	-
25	NC		-	-
26	NC	-	-	-
27	NC	-	-	-
28	NC		-	-
29	NC	-	-	-
30	NC	-	-	-

Note (1) Connector Part No.: JAE-FI-XB30SRL-HF10 or equivalent

Note (2) User's connector Part No: JAE-FI-X30C2L or equivalent

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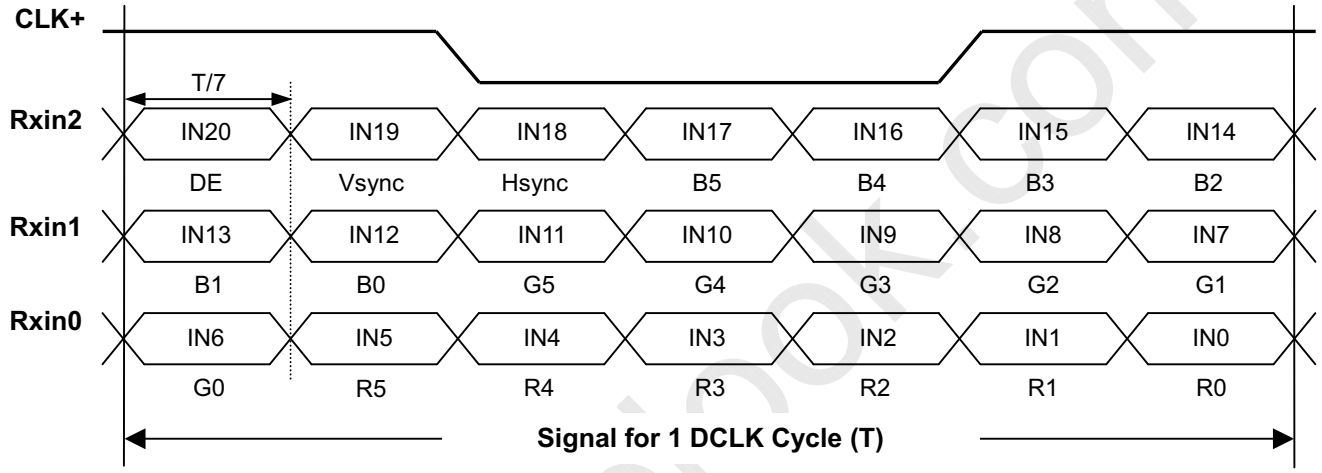
5.2 BACKLIGHT UNIT

Pin	Symbol	Description	Color
1	HV	High Voltage	Pink
2	LV	Ground	Black

Note (1) Connector Part No.: JST-BHSR-02VS-1 or equivalent

Note (2) User's connector Part No.: JST-SM02B-BHSS-1-TB or equivalent

5.3 TIMING DIAGRAM OF LVDS INPUT SIGNAL



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5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

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5.5 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPDI standards.

Byte #(decimal)	Byte #(hex)	Field Name and Comments	Value(hex)	Value(binary)
1	0	Header	00	00000000
2	1	Header	FF	11111111
3	2	Header	FF	11111111
4	3	Header	FF	11111111
5	4	Header	FF	11111111
6	5	Header	FF	11111111
7	6	Header	FF	11111111
8	7	Header	00	00000000
9	8	EISA ID manufacturer name (“CMO”)	0D	00001101
10	9	EISA ID manufacturer name (Compressed ASCII)	AF	10101111
11	0A	ID product code (N154I2-L05)	52	01010010
12	0B	ID product code (hex LSB first; N154I2-L05)	15	00010101
13	0C	ID S/N (fixed “0”)	00	00000000
14	0D	ID S/N (fixed “0”)	00	00000000
15	0E	ID S/N (fixed “0”)	00	00000000
16	0F	ID S/N (fixed “0”)	00	00000000
17	10	Week of manufacture (fixed “00H”)	00	00000000
18	11	Year of manufacture (fixed “00H”)	00	00000000
19	12	EDID structure version # (“1”)	01	00000001
20	13	EDID revision # (“3”)	03	00000011
21	14	Video I/P definition (“digital”)	80	10000000
22	15	Max H image size (“33cm”)	21	00100001
23	16	Max V image size (“21cm”)	15	00010101
24	17	Display Gamma (Gamma = ”2.2”)	78	01111000
25	18	Feature support (“Active off, RGB Color”)	0A	00001010
26	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	05	00000101
27	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	A0	10100000
28	1B	Red-x (Rx = “0.602”)	9A	10011010
29	1C	Red-y (Ry = “0.340”)	57	01010111
30	1D	Green-x (Gx = ”0.306”)	4E	01001110
31	1E	Green-y (Gy = ”0.521”)	85	10000101
32	1F	Blue-x (Bx = ”0.151”)	26	00100110
33	20	Blue-y (By = ”0.120”)	1E	00011110
34	21	White-x (Wx = ”0.313”)	50	01010000
35	22	White-y (Wy = ”0.329”)	54	01010100
36	23	Established timings 1	00	00000000
37	24	Established timings 2	00	00000000
38	25	Manufacturer’s reserved timings	00	00000000
39	26	Standard timing ID # 1	01	00000001
40	27	Standard timing ID # 1	01	00000001
41	28	Standard timing ID # 2	01	00000001
42	29	Standard timing ID # 2	01	00000001

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43	2A	Standard timing ID # 3	01	00000001
44	2B	Standard timing ID # 3	01	00000001
45	2C	Standard timing ID # 4	01	00000001
46	2D	Standard timing ID # 4	01	00000001
47	2E	Standard timing ID # 5	01	00000001
48	2F	Standard timing ID # 5	01	00000001
49	30	Standard timing ID # 6	01	00000001
50	31	Standard timing ID # 6	01	00000001
51	32	Standard timing ID # 7	01	00000001
52	33	Standard timing ID # 7	01	00000001
53	34	Standard timing ID # 8	01	00000001
54	35	Standard timing ID # 8	01	00000001
55	36	Detailed timing description # 1 Pixel clock (“71MHz”, According to VESA CVT Rev1.1)	BC	10111100
56	37	# 1 Pixel clock (hex LSB first)	1B	00011011
57	38	# 1 H active (“1280”)	00	00000000
58	39	# 1 H blank (“160”)	A0	10100000
59	3A	# 1 H active : H blank (“1280 : 160”)	50	01010000
60	3B	# 1 V active (”800”)	20	00100000
61	3C	# 1 V blank (”23”)	17	00010111
62	3D	# 1 V active : V blank (”800 :23”)	30	00110000
63	3E	# 1 H sync offset (”48”)	30	00110000
64	3F	# 1 H sync pulse width ("32”)	20	00100000
65	40	# 1 V sync offset : V sync pulse width (”3 : 6”)	36	00110110
66	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width (”48: 32 : 3 : 6”)	00	00000000
67	42	# 1 H image size (”331 mm”)	4B	01001011
68	43	# 1 V image size (”207 mm”)	CF	11001111
69	44	# 1 H image size : V image size (”331 : 207”)	10	00010000
70	45	# 1 H boarder (”0”)	00	00000000
71	46	# 1 V boarder (”0”)	00	00000000
72	47	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
73	48	Detailed timing description # 2	00	00000000
74	49	# 2 Flag	00	00000000
75	4A	# 2 Reserved	00	00000000
76	4B	# 2 FE (hex) defines ASCII string (Model Name “N154I2-L05”, ASCII)	FE	11111110
77	4C	# 2 Flag	00	00000000
78	4D	# 2 1st character of name (“N”)	4E	01001110
79	4E	# 2 2nd character of name (“1”)	31	00110001
80	4F	# 2 3rd character of name (“5”)	35	00110101
81	50	# 2 4th character of name (“4”)	34	00110100
82	51	# 2 5th character of name (“I”)	49	01001001
83	52	# 2 6th character of name (“2”)	32	00110010
84	53	# 2 7th character of name (“-”)	2D	00101101
85	54	# 2 8th character of name (“L”)	4C	01001100
86	55	# 2 9th character of name (“0”)	30	00110000
87	56	# 2 9th character of name (“5”)	35	00110101
88	57	# 2 New line character indicates end of ASCII string	0A	00001010
89	58	# 2 Padding with “Blank” character	20	00100000
90	59	# 2 Padding with “Blank” character	20	00100000

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91	5A	Detailed timing description # 3	00	00000000
92	5B	# 3 Flag	00	00000000
93	5C	# 3 Reserved	00	00000000
94	5D	# 3 FE (hex) defines ASCII string (Vendor “CMO”, ASCII)	FE	11111110
95	5E	# 3 Flag	00	00000000
96	5F	# 3 1st character of string (“C”)	43	01000011
97	60	# 3 2nd character of string (“M”)	4D	01001101
98	61	# 3 3rd character of string (“O”)	4F	01001111
99	62	# 3 New line character indicates end of ASCII string	0A	00001010
100	63	# 3 Padding with “Blank” character	20	00100000
101	64	# 3 Padding with “Blank” character	20	00100000
102	65	# 3 Padding with “Blank” character	20	00100000
103	66	# 3 Padding with “Blank” character	20	00100000
104	67	# 3 Padding with “Blank” character	20	00100000
105	68	# 3 Padding with “Blank” character	20	00100000
106	69	# 3 Padding with “Blank” character	20	00100000
107	6A	# 3 Padding with “Blank” character	20	00100000
108	6B	# 3 Padding with “Blank” character	20	00100000
109	6C	Detailed timing description # 4	00	00000000
110	6D	# 4 Flag	00	00000000
111	6E	# 4 Reserved	00	00000000
112	6F	# 4 FE (hex) defines ASCII string (Model Name“N154I2-L05”, ASCII)	FE	11111110
113	70	# 4 Flag	00	00000000
114	71	# 4 1st character of name (“N”)	4E	01001110
115	72	# 4 2nd character of name (“1”)	31	00110001
116	73	# 4 3rd character of name (“5”)	35	00110101
117	74	# 4 4th character of name (“4”)	34	00110100
118	75	# 4 5th character of name (“I”)	49	01001001
119	76	# 4 6th character of name (“2”)	32	00110010
120	77	# 4 7th character of name (“-”)	2D	00101101
121	78	# 4 8th character of name (“L”)	4C	01001100
122	79	# 4 9th character of name (“0”)	30	00110000
123	7A	# 4 9th character of name (“5”)	35	00110101
124	7B	# 4 New line character indicates end of ASCII string	0A	00001010
125	7C	# 4 Padding with “Blank” character	20	00100000
126	7D	# 4 Padding with “Blank” character	20	00100000
127	7E	Extension flag	00	00000000
128	7F	Checksum	37	00110111

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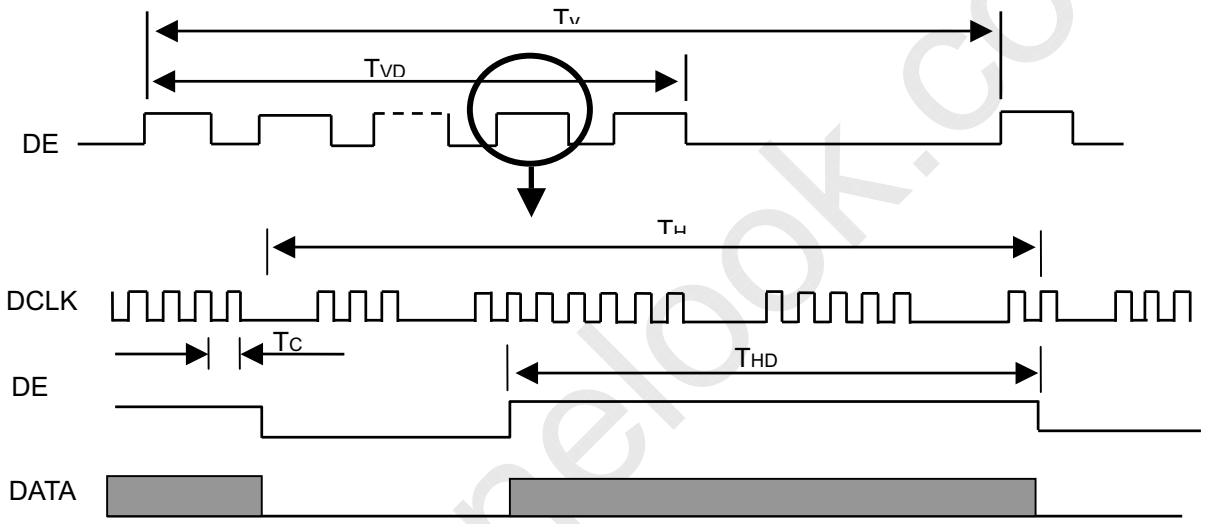
6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	-	71	80	MHz	-
DE	Vertical Total Time	TV	810	823	1000	TH	-
	Vertical Addressing Time	TVD	800	800	800	TH	-
	Horizontal Total Time	TH	1360	1440	1600	Tc	-
	Horizontal Addressing Time	THD	1280	1280	1280	Tc	-

INPUT SIGNAL TIMING DIAGRAM



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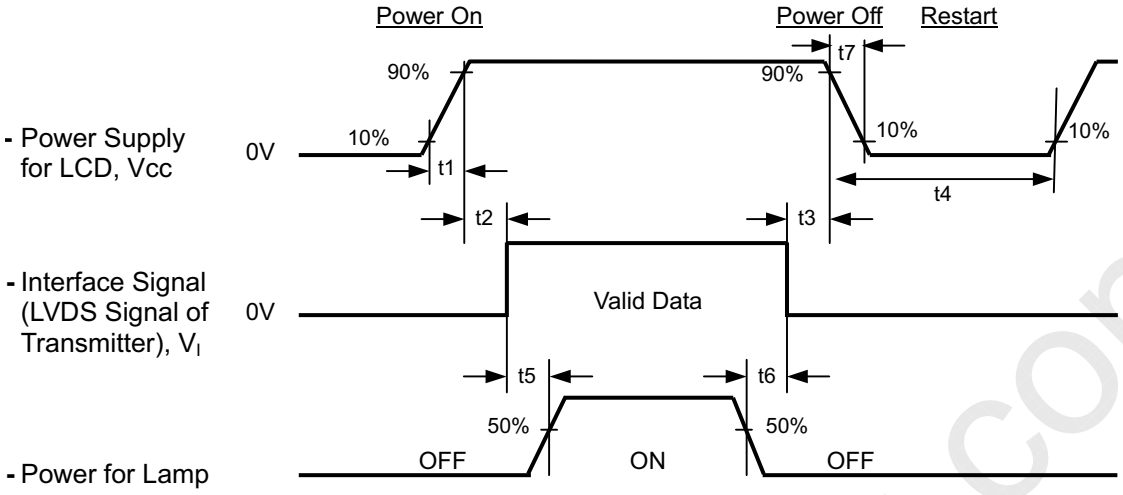
6.2 POWER ON/OFF SEQUENCE



Timing Specifications:

0.5< t1 <= 10 msec

0 < t2 <= 50 msec

0 < t3 <= 50 msec

t4 >= 500 msec

t5 >= 200 msec

t6 >= 200 msec

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time had better to follow

t7 >= 5 msec

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7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	6.0	mA
Inverter Driving Frequency	F_L	55	KHz
Inverter	Sumida-H05-4915		

The measurement methods of optical characteristics are shown in Section 7.2. The following items should be measured under the test conditions described in Section 7.1 and stable environment shown in Note (6).

7.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle	280	400	-	-	(2), (5)
Response Time		T_R		-	3	6	ms	(3)
		T_F		-	5	10	ms	
Average Luminance of White		L_{AVE}		185	220	-	cd/m^2	
Color Chromaticity	Red	Rx		TYP. -0.03	0.602	TYP. +0.03	-	(1)
		Ry			0.340		-	
	Green	Gx			0.306		-	
		Gy			0.521		-	
	Blue	Bx			0.151		-	
		By			0.120		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
	Color Gamut	C.G.		42	45		%	(7)
Viewing Angle	Horizontal	θ_x+	CR≥10	40	45	-	Deg.	(1),(5)
		θ_x-		40	45	-		
	Vertical	θ_Y+		15	20	-		
		θ_Y-		40	45	-		
White Variation of 5 Points		δW_{5p}	θ_x=0°, θ_Y =0° (BM-5A)	80	-	-	%	(5),(6)
White Variation of 13 Points		δW_{13p}		65	-	-	%	

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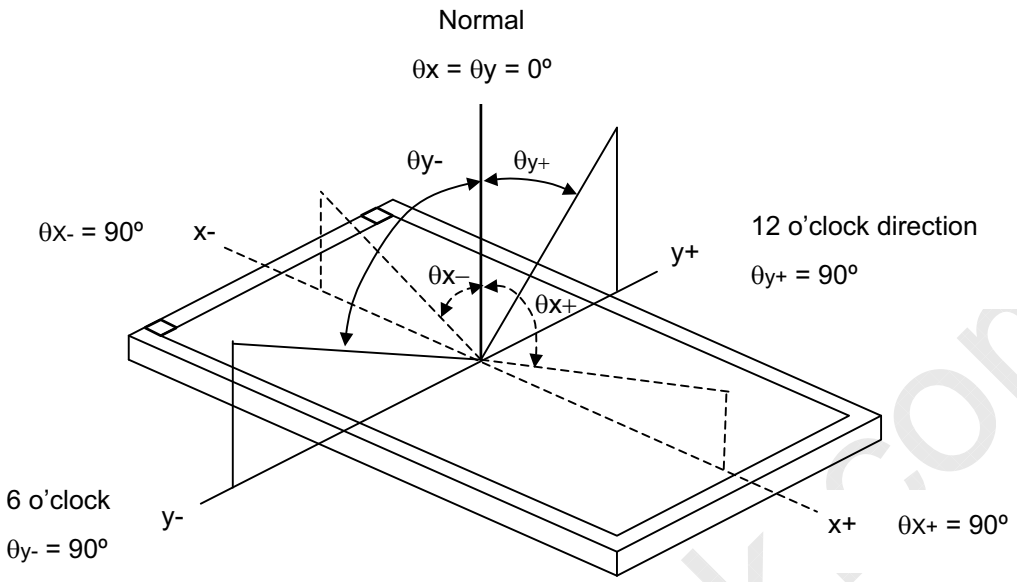
Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

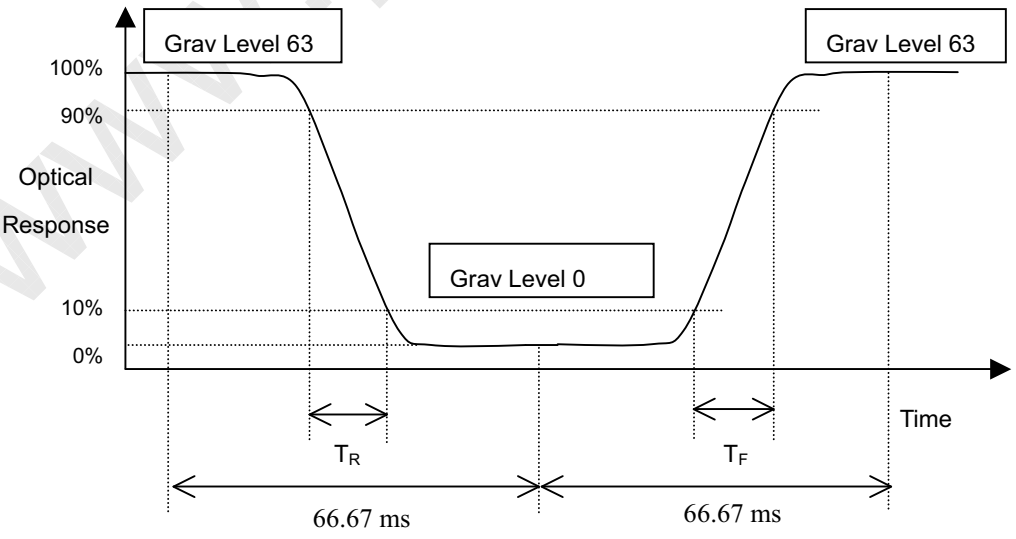
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



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Note (4) Definition of Average Luminance of White (L_{AVE}):

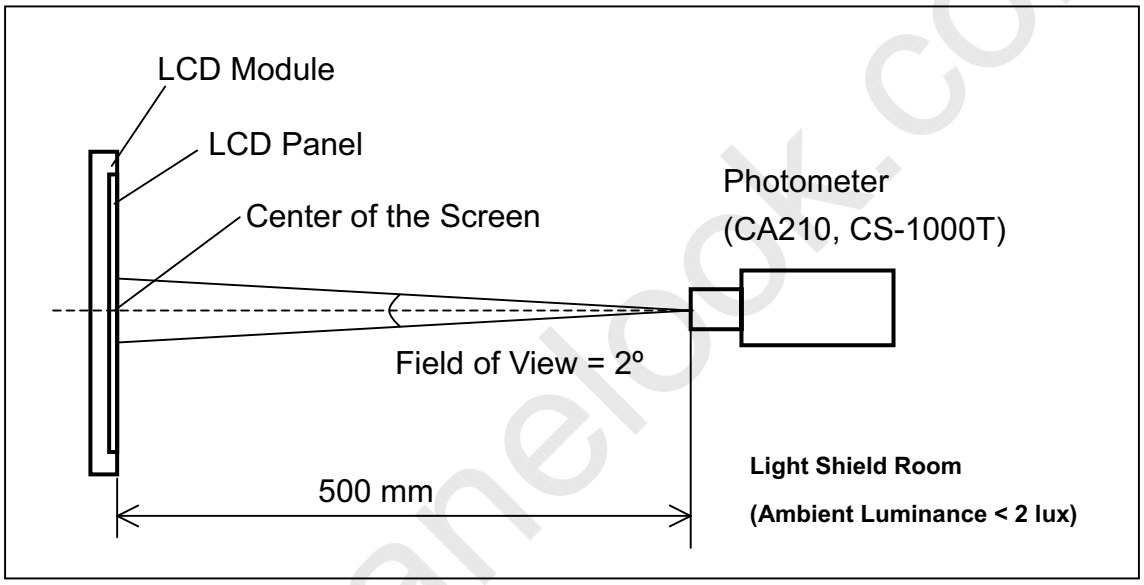
Measure the luminance of gray level 63 at 5 points

L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



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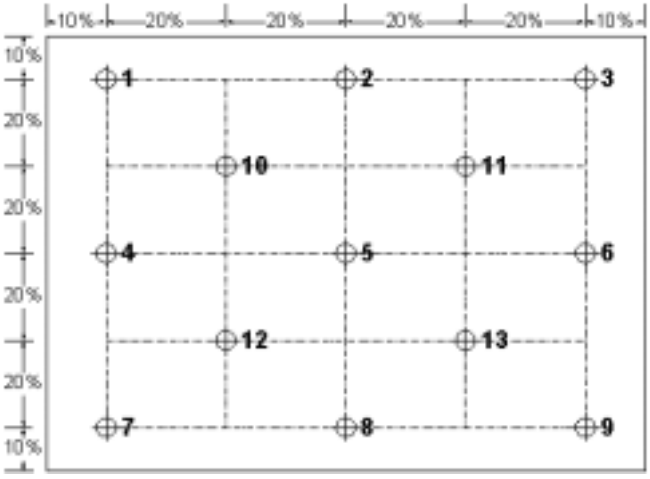
Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW_{5p} = Minimum [L (10)+ L (11)+ L (12)+ L (13)+ L (5)] / Maximum [L (10)+ L (11)+ L (12)+ L (13)+ L (5)]

δW_{13p} = Minimum [L (1) ~ L (13)] / Maximum [L (1) ~ L (13)]



Active area

Ⓧ : Test Point

X=1 to 13

Note (7) Definition of color gamut (C.G%):

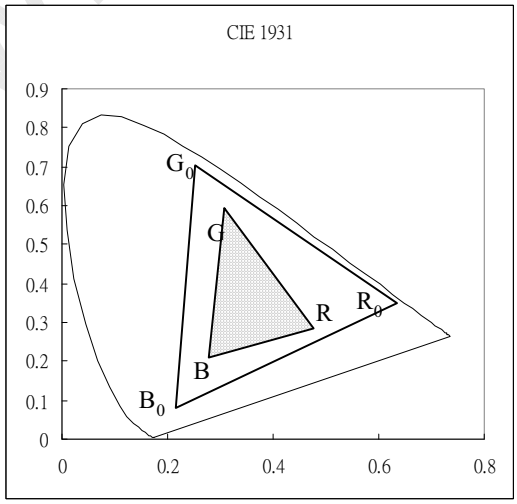
C.G%= R G B / R_0 G_0 B_0,*100%

R_0, G_0, B_0 : color coordinates of red, green, and blue defined by NTSC, respectively.

R, G, B : color coordinates of module on 63 gray levels of red, green, and blue, respectively.

R_0 G_0 B_0 : area of triangle defined by R_0, G_0, B_0

. R G B: area of triangle defined by R, G, B



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8. PRECAUTIONS

8.1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the lamp wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

8.2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

8.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

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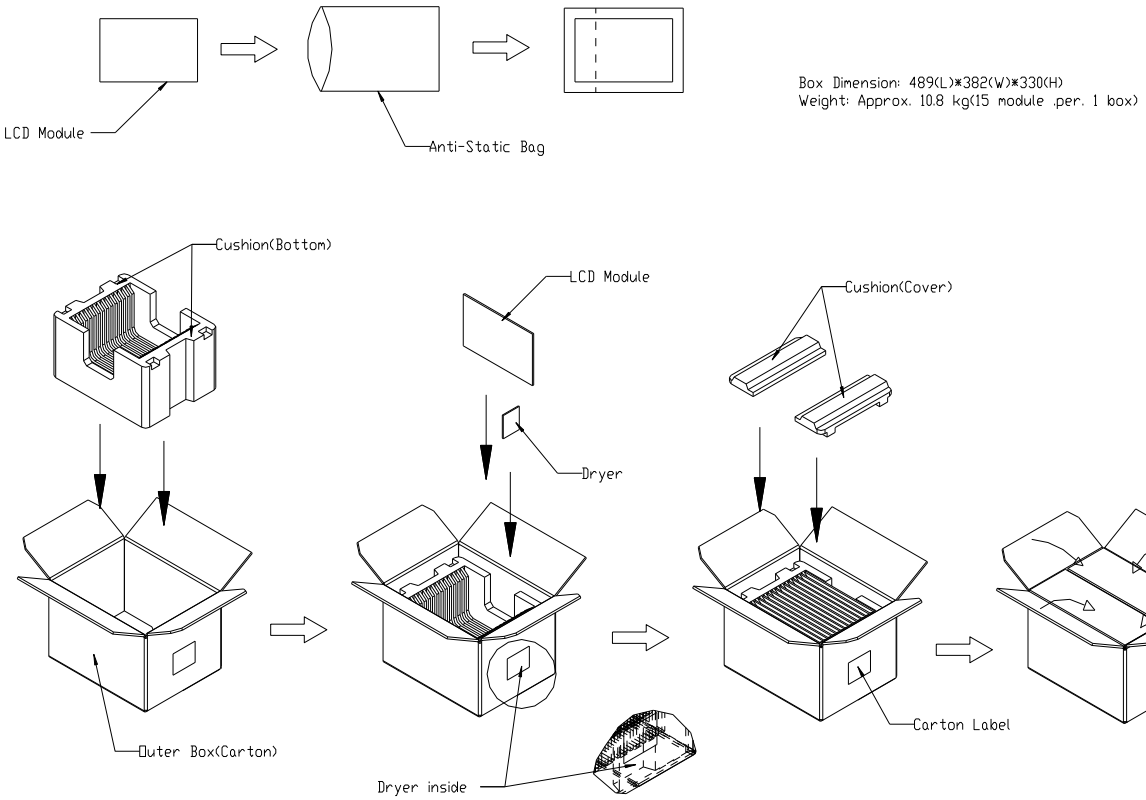
9. PACKING

9.1 CARTON



Packing testing criteria :

(1) Packing drop : 1 corner, 3 edges, 6 faces, each direction for one time, follow ISTA standard.

(2) Packing vibration : Random, follow ISTA standard.

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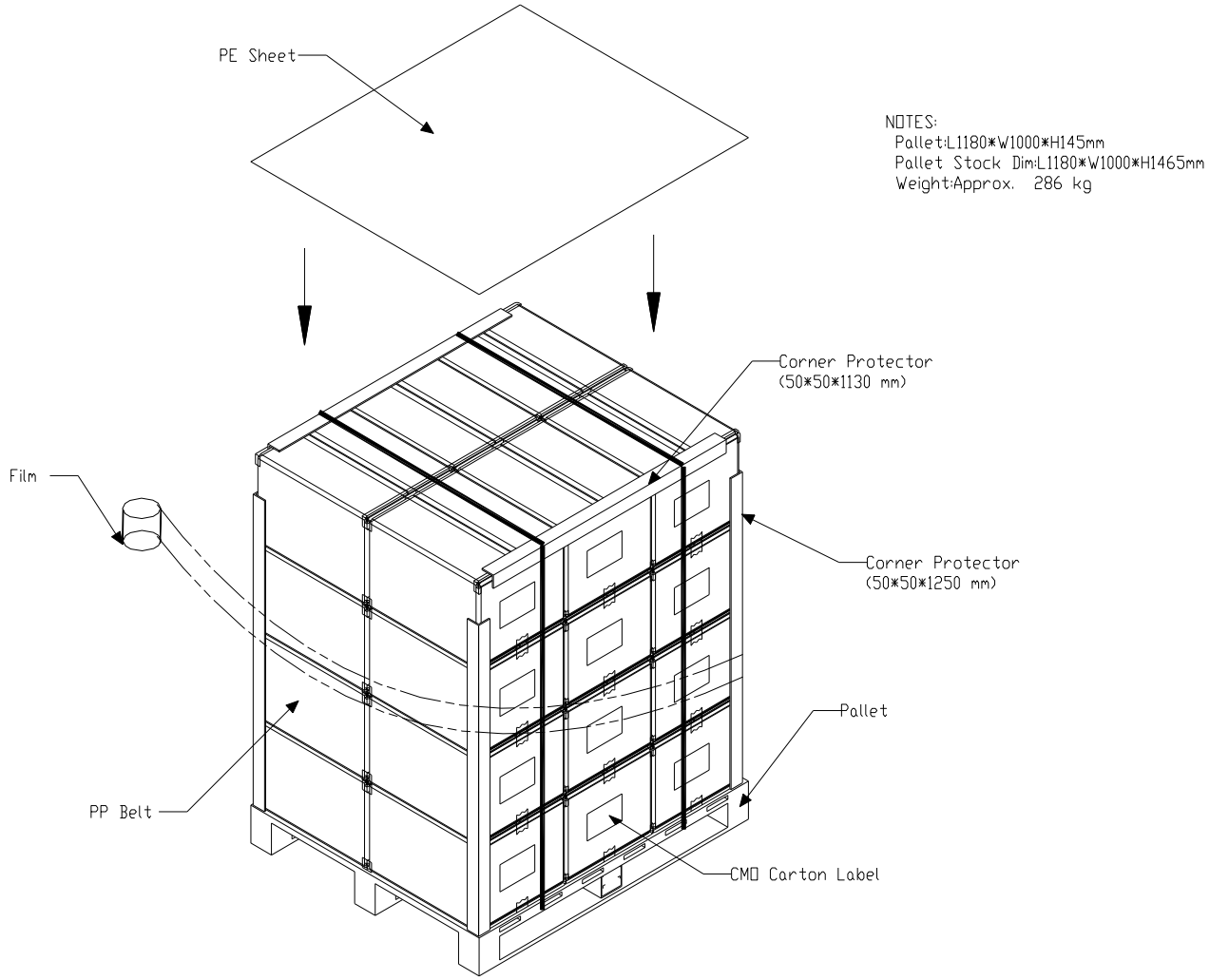
9.2 PALLET



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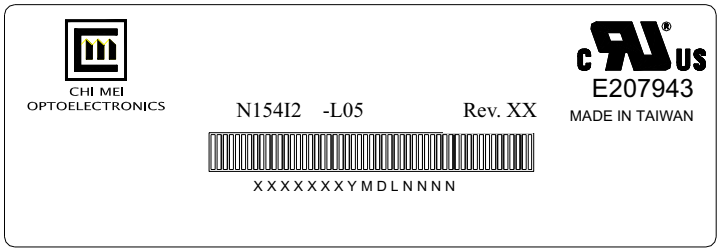
10. DEFINITION OF LABELS

10.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: N154I2 - L05

(b) Revision: Rev. XX, for example: C1, C2 …etc.

(c) Serial ID: X X X X X X Y M D L N N N N

- Serial No.
- Product Line
- Year, Month, Date
- CMO Internal Use
- Revision
- CMO Internal Use

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

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10.2 CARTON LABEL

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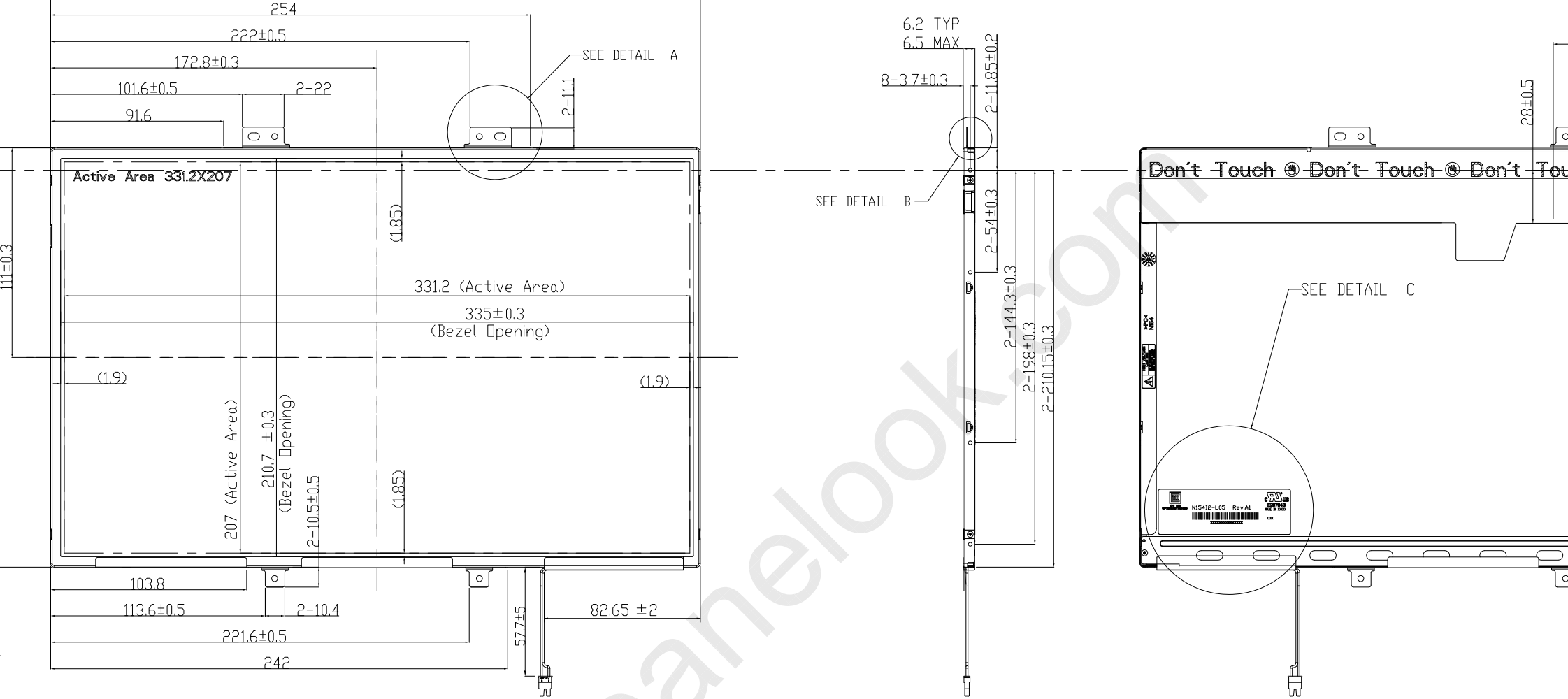
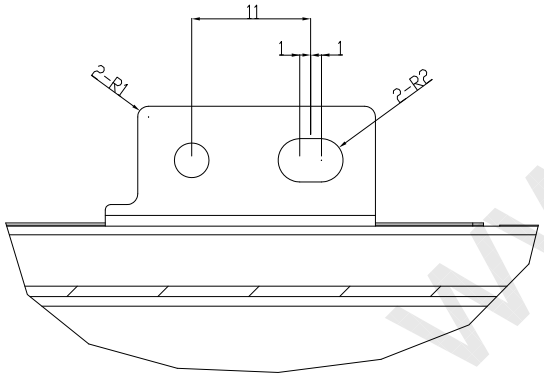
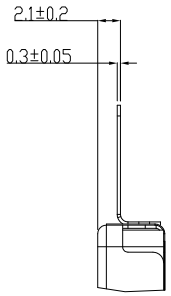
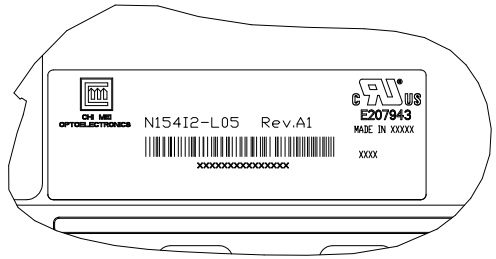




DETAIL A
SCALE 4:1



DETAIL B
SCALE 4:1



DETAIL C
SCALE 2:1

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